

REMARKS

Claims 1-27 are pending in this application. Claims 23-27 are currently withdrawn. By this Amendment, claims 2, 3, 13 and 14 are amended to overcome the rejection under 35 U.S.C. §112, second paragraph. In addition, claims 6, 8-11, 17 and 19-22 are amended to address the teachings of Akiyoshi.

I. Rejection Under 35 U.S.C. §112, Second Paragraph

Claims 2, 3, 13 and 14 were rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite. This rejection is respectfully traversed.

Claims 2, 3, 13 and 14 are amended to include the phrase "in lattice constant" to further recite that the difference between the substrate and the Fe-Si based thin film is in lattice constant and the difference between the buffer layer and the Fe-Si based thin film is also in lattice constant. The support for amended claims 2, 3, 13 and 14 can be found in the original specification, for example at paragraph [0011] of the specification.

For the foregoing reasons, Applicant respectfully submits that the rejection under 35 U.S.C. §112, second paragraph, is overcome. Reconsideration and withdrawal of the rejection are respectfully requested.

II. Rejections Under 35 U.S.C. §103(a)

A. Rejection based on Akiyoshi in view of Shiiki

Claims 1-9 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over JP 2001-064099 ("Akiyoshi") in view of U.S. Patent No. 4,576,876 ("Shiiki"). This rejection is respectfully traversed.

Claim 1, as amended, recites a method for fabricating a Fe-Si based thin film that includes preparing a substrate of which the crystal planes are oriented perpendicular to a main surface thereof and made of the same kind of ion and performing film forming operation on the main surface of the substrate to epitaxially grow a Fe-Si based thin film thereon.

Akiyoshi teaches forming a β Fe-Si₂ epitaxial layer on an n-type Si-substrate of the (100) plane on a substrate holder provided in a vacuum chamber of a magnetron sputtering device and then depositing Fe on the Si-substrate by sputtering using gaseous Xe as the sputtering gas while heating the substrate so as to keep its temperature at 550 to 650°C.

The Patent Office asserts that Akiyoshi teaches a method for fabricating a Fe-Si film wherein a substrate is first prepared and a Fe-Si alloy based film is formed on the substrate epitaxially. The Patent Office further asserts Akiyoshi teaches that the plane of the substrate to be employed is oriented (100) or (111). Applicant respectfully disagrees.

Nowhere does Akiyoshi teach or suggest preparing a substrate of which the crystal planes are oriented perpendicular to a main surface thereof and made of the same kind of ion as recited in claim 1. In addition, referring to the paragraph [0065] of Akiyoshi, Akiyoshi merely teaches that the Si substrate of p mold of a field (100) and the Si substrate of n mold of a field (111) are employed. It is not evident from the teachings of Akiyoshi that the Si substrate of the field (100) means a (100) Si substrate and the Si substrate of the field (111) means a (111) Si substrate.

Furthermore, Akiyoshi teaches that the Si substrate to be employed is doped by some dopants to form the n-type Si substrate and the p-type Si substrate. See Akiyoshi, paragraph [0030]. Claims 6, 8 and 9 as amended, however, recite the substrate is non-doped. As explained in paragraph [0022] of the specification, although the (100) Si substrate and the (111) Si substrate can be employed, the Si substrates are non-doped for the intended epitaxial growth. Thus, Akiyoshi does not teach or suggest the use of a non-doped Si substrate as claimed.

The Patent Office admits that Akiyoshi does not teach or suggest preparing a substrate of which the crystal planes are oriented perpendicular to a main surface thereof as recited in claim 1. However, the Patent Office relied on Shiiki as allegedly teaching the crystal planes

being oriented perpendicular to the main surface of the substrate. However, even if Shiiki were to have been combined with Akiyoshi as alleged by the Patent Office, the presently claimed subject matter still would not have been achieved because Shiiki does not remedy the deficiencies of Akiyoshi.

Specifically, Shiiki teaches that when an intermediate layer containing crystals of a hexagonal system, such as Ti and Zn, is formed, the c-axis of the intermediate layer extends at right angles to the substrate surface. See Shiiki, column 3, lines 62-66. Claim 1, however, requires that the crystal plane of the substrate to be employed is oriented perpendicular to the main surface thereof instead of an intermediate layer as taught by Shiiki. Thus, Shiiki also does not teach or suggest the use of a substrate of which the crystal plane is oriented perpendicular to the main surface of the substrate as recited in claim 1.

For the foregoing reasons, Applicant respectfully submits that Akiyoshi and Shiiki, alone or in combination, would not have led one of ordinary skill in the art to claims 1-9. Reconsideration and withdrawal of this rejection are respectfully requested.

**B. Rejection Based on Akiyoshi in View of Shiiki
and Further in View of Noguchi and Lee**

Claim 10 was rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Akiyoshi in view of Shiiki as applied to claims 1-9 above, and further in view of U.S. Patent No. 5,211,761 ("Noguchi") and U.S. Patent No. 6,531,235 ("Lee"). This rejection is respectfully traversed.

As discussed extensively above, Akiyoshi fails to teach or suggest the method for fabricating a Fe-Si based thin film as claimed. The Patent Office relied on the combination of Noguchi and Lee as allegedly teaching the use of a substrate being made of (100) $Y_2O_3-ZrO_2$ and the Fe-Si based thin film being epitaxially grown in two rotational symmetry. However, even if Noguchi and Lee were to have been combined with Akiyoshi and/or Shiiki as alleged

by the Patent Office, the presently claimed subject matter still would not have been achieved because neither Noguchi nor Lee remedies the deficiencies of Akiyoshi and/or Shiiki. Specifically, Noguchi and Lee also do not teach or suggest preparing a substrate of which the crystal planes are oriented perpendicular to a main surface of the substrate as recited in claim 1.

For the foregoing reasons, Applicant respectfully submits that Akiyoshi, Shiiki, Noguchi and Lee, alone or in combination, would not have led one of ordinary skill in the art to claims 1, 7, 9 and 10.

Reconsideration and withdrawal of this rejection are respectfully requested.

**C. Rejection Based on Akiyoshi in view of Shiiki
and Further in View of Noguchi and Schoop**

Claim 11 was rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Akiyoshi in view of Shiiki as applied to claims 1-9 above, and further in view of Noguchi and U.S. Patent No. 6,537,689 ("Schoop"). This rejection is respectfully traversed.

As discussed extensively above, Akiyoshi, Shiiki and Noguchi, alone or in combination, fail to teach or suggest the method for fabricating a Fe-Si based thin film as claimed. The Patent Office relied on Schoop as allegedly teaching a buffer material for a subsequent layer that is (001) oriented and can be Al_2O_3 . However, even if Akiyoshi, Shiiki, and Noguchi were to have been combined with Schoop as alleged by the Patent Office, the presently claimed subject matter still would not have been achieved because Schoop does not remedy the deficiencies of Akiyoshi, Shiiki and/or Noguchi. Specifically, Schoop also does not teach or suggest preparing a substrate of which the crystal planes are oriented perpendicular to a main surface of the substrate as recited in claim 1.

For the foregoing reasons, Applicant respectfully submits that Akiyoshi, Shiiki, Noguchi and Schoop, alone or in combination, would not have led one of ordinary skill in the art to claims 1, 7, 9 and 11.

Reconsideration and withdrawal of this rejection are respectfully requested.

D. Rejection Based on Shiiki in View of Akiyoshi

Claims 12-16 and 18 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Shiiki in view of Akiyoshi. This rejection is respectfully traversed.

Claim 12 recites a method for fabricating a Fe-Si based thin film that includes preparing a given substrate, forming, on the substrate, a buffer layer of which the crystal planes are oriented perpendicular to a main surface thereof and made of the same kind of ion, and performing film forming operation on the main surface of the buffer layer to epitaxially grow a Fe-Si based thin film thereon.

As discussed above, Shiiki teaches an intermediate layer containing crystals of a hexagonal system such as Ti and Zn formed so that the c-axis of the intermediate layer extends as right angles to the substrate surface. See Shiiki, column 3, lines 63-66. Nowhere does Shiiki teach or suggest performing film forming operation on the main surface of the buffer layer to epitaxially grow a Fe-Si based thin film thereon. The Patent Office relied on Akiyoshi as allegedly teaching epitaxially growing a Fe-Si thin film on the substrate. However, nowhere does Akiyoshi teach or suggest forming a buffer layer as recited in claim 12.

According to MPEP §2143.01, obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention if there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In this case, as discussed above, neither Shiiki nor Akiyoshi teaches any motivation to

combine the two references or otherwise derive the claimed invention as each reference lacks the features recited in claim 12. As such, the teachings of Shiiki and Akiyoshi would not be sufficient for one of ordinary skill in the art to make the proposed combination. Thus, the combination of Shiiki and Akiyoshi would not have led one of ordinary skill in the art to claim 12 and claims dependent therefrom.

For the foregoing reasons, Applicant respectfully submits that Shiiki and Akiyoshi, alone or in combination, would not have led one of ordinary skill in the art to claims 12-16 and 18. Reconsideration and withdrawal of this rejection are respectfully requested.

**E. Rejection Based on Shiiki in View of Akiyoshi
and Further in View of Yano**

Claims 17 and 19 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Shiiki in view of Akiyoshi as applied to claims 12-16 and 18 above, and further in view of U.S. Patent No. 6,045,626 ("Yano"). This rejection is respectfully traversed.

As discussed extensively above, both Shiiki and Akiyoshi fail to teach or suggest the method for fabricating a Fe-Si based thin film as recited in claim 12. Furthermore, neither Shiiki nor Akiyoshi teach or suggest the use of a non-doped Si buffer layer or another non-doped buffer layer as recited in claims 17 and 19. The Patent Office relied on Yano as allegedly teaching a YSZ (yttria zirconia) buffer layer where the film has a 111 orientation. However, even if Shiiki and Akiyoshi were to have been combined with Yano as alleged by the Patent Office, presently claimed subject matter still would not have been achieved because Yano does not remedy the deficiencies of Shiiki and Akiyoshi. Specifically, Yano also does not teach or suggest performing film forming operation on the main surface of the buffer layer to epitaxially grow a Fe-Si based thin film as recited in claim 12.

For the foregoing reasons, Applicant respectfully submits that Shiiki, Akiyoshi and Yano, alone or in combination, would not have led one of ordinary skill in the art to claims 12, 17, 18 and 19. Reconsideration and withdrawal of this rejection are respectfully requested.

F. Rejection Based on Shiiki in View of Akiyoshi and Further in View of Lee

Claims 20 and 21 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Shiiki in view of Akiyoshi as applied to claims 12-16 and 18 above, and further in view of Lee. This rejection is respectfully traversed.

As discussed extensively above, both Shiiki and Akiyoshi fail to teach or suggest the method for fabricating a Fe-Si based thin film as recited in claim 12. Furthermore, neither Shiiki nor Akiyoshi teach or suggest the use of a non-doped Si buffer layer or another non-doped buffer layer as recited in claims 20 and 21. The Patent Office relied on Lee as allegedly teaching a yttria zirconia buffer layer for supporting a subsequent layer oriented in the (100) direction and the Fe-Si film is epitaxially grown in two rotational symmetry. However, even if Shiiki and Akiyoshi were to have been combined with Lee as alleged by the Patent Office, the presently claimed subject matter still would not have been achieved because Lee does not remedy deficiencies of Shiiki and Akiyoshi. Specifically, Lee also does not teach or suggest performing film forming operation on the main surface of the buffer layer to epitaxially grow a Fe-Si based thin film as recited in claim 12.

For the foregoing reasons, Applicant respectfully submits that Shiiki, Akiyoshi and Lee, alone or in combination, would not have led one of ordinary skill in the art to claims 12, 18, 20 and 21. Reconsideration and withdrawal of this rejection are respectfully requested.

**G. Rejection Based on Shiiki in View of Akiyoshi
and Further in View of Schoop**

Claim 22 was rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Shiiki in view of Akiyoshi as applied to claims 12-16 and 18 above, and further in view of Schoop. This rejection is respectfully traversed.

As discussed extensively above, Shiiki and Akiyoshi fail to teach or suggest the method for fabricating a Fe-Si based thin film as recited in claim 12. Furthermore, neither Shiiki nor Akiyoshi teach or suggest the use of a non-doped (001) buffer layer as recited in claim 22. The Patent Office relied on Schoop as allegedly teaching a buffer material for a subsequent layer that is (001) oriented and can be Al_2O_3 . However, even if Shiiki and Akiyoshi were to have been combined with Schoop as alleged by the Patent Office, the presently claimed subject matter still would not have been achieved because Schoop does not remedy the deficiencies of Shiiki and Akiyoshi. Specifically, Schoop also does not teach or suggest performing film forming operation on the main surface of the buffer layer to epitaxially grow a Fe-Si based thin film as recited in claim 12.

For the foregoing reasons, Applicant respectfully submits that Shiiki, Akiyoshi and Schoop, alone or in combination, would not have led one of ordinary skill in the art to claims 12, 18, 20 and 22. Reconsideration and withdrawal of this rejection are respectfully requested.

III. Rejoinder

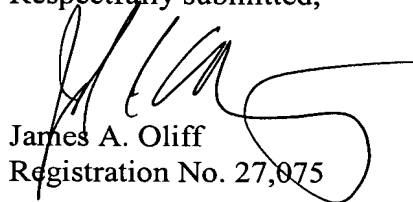
Applicant submits that upon allowance of claims 1-22, product claims 23-27 should be rejoined with the application and similarly allowed.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-27 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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